News (cont. from p. 345)

Solar Max: Three Hits, One Save. . .

In the end it was all smiles and congratulations, but the crew of the space shuttle *Challenger* and NASA engineers in Houston and at the Goddard Space Flight Center in Greenbelt, Md., were not forgetting how close the Solar Maximum (Solar Max) satellite repair mission had come to being the Solar Max destruction mission. In fact, if it had not been for a late night resuscitation effort by a team of engineers at Goddard and a particularly providential sunrise, the shuttle crew might never have gotten their hands back on the $200 million orbiting solar observatory after a docking attempt on the mission's third day knocked it out of kilter. As it is, thanks to the astronauts' skilled repair work, the satellite is now ready for another 6 years or more of sun watching.

Solar Max had been stranded in space since 1980, the victim of blown fuses in its attitude control system that left four of its seven science instruments without accurate pointing capability. Shortly after the blow out, Goddard technicians had put the satellite in a slow, "coning" spin to keep its solar panels pointing at the sun and the batteries charged up. In this holding pattern, turning at the rate of 1° per second, the first satellite designed to be reserviced in orbit had awaited its rescuers for more than 3 years.

Challenger and its repair crew were launched on April 6, 1984. The trouble started two days later, when astronaut George Nelson tried to dock with Solar Max and steady it so that it could be picked up by the shuttle's long mechanical arm. Three times he tried to mate a cylindrical attachment device to a trunnion pin protruding from the satellite's midsection, but three times he bounced away without the device locking (the problem, it now appears, was with a small stud next to the pin that did not show up in engineering blueprints).

Up until this time, Solar Max had been turning like a very slow and steady top. Now, because of the docking jolts and Nelson's unsuccesful attempt to steady the satellite by grabbing onto one of its winglike solar panels, it was tumbling more rapidly around all three of its axes. The crew tried to grab the satellite with the shuttle's arm despite the unpredictable tumbling, and came "close, but no cigar," according to commander Robert Crippen, before getting word that technicians at Goddard (Solar Max's command center) believed they could stop the satellite's rotation from the ground.

What followed was a day-long race to get the spacecraft under control before it ran out of power, because now that its panels were no longer pointing at the sun, Solar Max's onboard batteries were draining without recharging. After shutting off all the spacecraft systems they could spare, including the heaters for the science instruments, the Goddard team activated magnetic torquer bars in the spacecraft that act as a kind of lever against

Forum

Child Care at National Meetings

Is your participation in AGU meetings limited by the lack of child care facilities? Would you be willing to pay for such services? The AGU Education and Human Resources Committee surveyed a sample of members, and our findings were inconclusive. If your meeting attendance depends on the availability of daycare, please write a brief note to that effect, and send it to the committee at AGU Headquarters. If response to this request is sufficient, this committee will recommend that some action be taken.

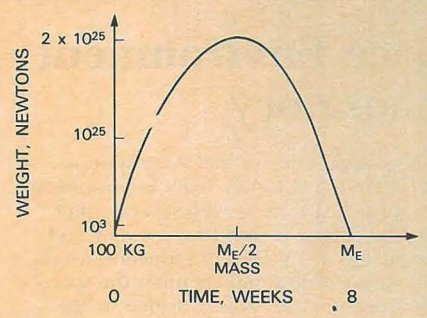
Louise Levien
Member, AGU Education
and Human Resources Committee

Geophysical Weight Loss Diet

Having for numerous reasons acquired a three digit kilogram mass, the author is experienced at the painful struggles that the gourmand must suffer to reduce weight, particularly if he/she enjoys reasonably large amounts of good food. To the avant-garde geophysicist, utilizing the following approach could be pleasurable, rewarding, and may even enable the accomplishment of what Ghengis Khan, Alexander the Great, Napolean, and Hitler could not!

The basic approach is the full utilization of Newton's formula for the attraction of two massive bodies: $F=GM_1M_2/r^2$, where G, is the gravitational constant; r, the distance between the two bodies; and M_1 and M_2, the masses of the two bodies. Although one usually chooses M_1 to be the earth's mass M_E and M_2 to be the mass of a small object, this unnecessarily restricts the realm of phenomena. The less restrictive assumption is $M_1 + M_2 = M_E$.

Utilizing this latter equation has enabled the development of the Geophysical Weight Loss Diet. The figure is a plot of the expected weight changes. Do not fear the initial weight gain, for, as the curve shows, a final weight loss is guaranteed!



The Diet:Week 1, Consume herds of cattle, devastate crop fields.
Week 2, Pillage viliages, farms, and lay waste to the countryside.
Week 3, Develop a taste for small mountain ranges, gorge your thirst on great lakes.
Week 4, Delight on crustal dining, sample the refreshing taste of a small ocean.
Week 5, Enjoy more of the pie, taste the mantle below the crust, nibble on the core for dessert.
Week 6, Work your way through to the other side; no need to worry about iron pills.
Week 7, Watch those pounds disappear.
Week 8, Finally enjoy the culture and food of the antipodes.

As with many diets, there are some side effects. The worst appears that there is nothing left to eat at the end, unless one becomes an astronomical gastronome!

Acknowledgement The benefits of this approach were discussed with Kwing Chan, Dick Goldberg, Hans Mayr, and Nathan Miller et al. during a Chinese New Year's festivity.

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Seismic Cross Sections of the Upper Mantle

Surface wave tomography is being used to map the seismic velocity and anisotropy of the upper mantle on a global basis [*Nataf et al.*, Anisotropy and shear-velocity heterogeneities in the upper mantle, *Geophys. Res. Lett.*, *11*, 109–112, 1984].

The color figure shows cross sections of the upper 670 km of the mantle. (Note previous example published on the cover of *Eos*, April 17, 1984.) VSV is the velocity of vertically polarized shear waves, averaged with respect to azimuth. The orange regions are slow, presumably hot, regions of the mantle, although VSV can be low due to crystal orientation, or anisotropy, as well as to high temperature. The ambiguity is removed by studying the anisotropy. The parameter XI is related to VSH-VSV, the difference in velocity between the two polarizations of shear waves. Olivine crystals oriented with the fast axis in the horizontal plane would give positive XI. This would be the expected situation for horizontal flow. Vertical flow is expected to give negative XI for an olivine-rich mantle. The cross sections for XI, with this interpretation, would be orange in regions of ascending and descending flow.

The cross sections are labeled with the parameters of the great circle, right latitude, longitude, and azimuth. The horizontal line across the center of the map is the great circle of the cross section. The horizontal lines in the cross sections are at depths of 60, 220, and 400 km.

Note the deep, 400 km, slow anomalies under the Afar triple junction and the East Pacific Rise. The apparent sources of the mid-oceanic ridges are often offset from their surface expressions. The fast material at depth under South America, the south Atlantic, and the western Pacific may represent material that cooled at the earth's surface. The three-dimensional character of mantle flow is evident when viewing many of these cross sections. The mid-Atlantic ridge appears to be shallow on these cross sections but can be traced to greater depth in other sections. This suggests that there is large lateral transport of material between source and ridge.

Tomographic research at Caltech is supported by National Science Foundation grants EAR-8115236 and EAR-8317623. I thank Robert Clayton, Bradford Hager, and Adam Dziewonski for assistance in making the illustrations.

This news item and photo was contributed by Don. L. Anderson, *Seismological Laboratory, California Institute of Technology, Pasadena, CA 91125.*